

Hydrogeophysical Investigations of Groundwater Resources and Demarcation of Saltwater-Freshwater Interface in Kilwa Kisiwani Island, Se Tanzania

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Abstract : The main objective of this research was to identify new potential sources of groundwater resources using geophysical methods and also to demarcate the saltwater - freshwater interface. Kilwa Kisiwani Island geologically is covered mostly by Quaternary alluvial sediments, sand, and gravel. The geophysical techniques employed during the research include Vertical Electrical Sounding (VES), Earth Resistivity Tomography (ERT), and Transient Electromagnetics (TEM). Two-dimensional interpolated geophysical results show that there exist freshwater lenses formations that are potential aquifers on the Island with resistivity values ranging from 11.68 Ωm to 46.71 Ωm . These freshwater lenses are underlain by formation with brackish water in which the resistivity values are varying between 3.89 Ωm and 1.6 Ωm . Saltwater with resistivity less than 1 Ωm is found at the bottom being overlaid by brackish saturated formation. VES resistivity results show that 89% (16 out of 18) of the VES sites are potential for groundwater resources drilling while TEM results indicate that 75% (12 out of 16) of TEM sites are potential for groundwater borehole drilling. The recommended drilling depths for potential sites in Kilwa Kisiwani Island show that the maximum depth is 25 m and the minimum being 10 m below ground surface. The aquifer structure in Kilwa Kisiwani Island is a shallow, unconfined freshwater lenses floating above the seawater and the maximum thickness of the aquifer is 25 m for few selected VES and TEM sites while the minimum thickness being 10 m.

Keywords : groundwater, hydrogeophysical, Kilwa Kisiwani, freshwater, saltwater, resistivity

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020